

What is Claimed is:

1. A variable gain amplifier comprising:
an input resistor coupled to an input signal;
5 an operational amplifier further comprising:
a pre-drive stage coupled to the input resistor; and
a plurality of output stages, one of the output stages is chosen by a control signal to couple to the pre-drive stage; and
10 a plurality of feedback resistors, each feedback resistor being coupled to the pre-drive stage by one end thereof and coupled to one of the plurality of output stages by another end thereof;
wherein a feedback loop is formed by the chosen output stages and the feedback resistor corresponding to the chosen output stage.
2. The variable gain amplifier of claim 1, wherein the input resistor is
15 coupled to the operational amplifier by way of an electrostatic discharge protection device.
3. The variable gain amplifier of claim 1, wherein each of the output stages further comprises:
20 a PMOS transistor, whereof a source is connected to a supply voltage;
an NMOS transistor, whereof a source is grounded and a drain is coupled to the PMOS transistor;
a first MOS switch coupled between the pre-drive stage and a gate of the NMOS transistor, a gate of the first MOS switch being coupled to the first control signal;
25 a second MOS switch coupled between the pre-drive stage and a gate of the PMOS transistor, a gate of the second MOS switch being coupled to a second control signal;

a third MOS switch coupled between the gate of the NMOS transistor and ground, a gate of the third MOS switch being coupled to the second control signal; and

5 a fourth MOS switch coupled between the gate of the PMOS transistor and the supply voltage, a gate of the fourth MOS switch being coupled to the first control signal;

wherein the second control signal is a complementary signal of the first control signal.

4. The variable gain amplifier of claim 1, wherein each output stage
10 further comprises:

a PMOS transistor coupled to a supply voltage;

a NMOS transistor coupled between the PMOS transistor and ground;

a first switch;

a second switch;

15 wherein the first switch is used for connecting a gate of the PMOS transistor to the pre-drive stage when the first control signal is in a first state, and the second switch is used for connecting a gate of the NMOS transistor to the pre-drive stage when the first control signal is in the first state.

5. A variable gain amplifier comprising:

20 a first stage operational amplification unit for providing a first gain, comprising:

a first input resistor coupled to an input signal;

an operational amplifier comprising:

a pre-drive stage coupled to the input resistor; and

25 a plurality of output stages, each output stage coupled to the pre-drive stage; and

a plurality of first feedback resistors, each first feedback resistor being

coupled to the pre-drive stage by one end thereof and coupled to one of the plurality of output stages by another end thereof; and

a second stage operational amplification unit coupled to the first stage operational amplification unit, for providing a second gain;

5 wherein a first feedback loop is formed by one of the output stages chosen by a first control signal and the first feedback resistor corresponding to the chosen output stage, and a gain of the variable gain amplifier corresponds to the first and the second gain.

10 6. The variable gain amplifier of claim 5, wherein the second stage operational amplification unit comprises:

a plurality of second input resistors, each second input resistor being coupled to a corresponding first feedback resistor of the first stage operational amplification unit;

15 a plurality of first switches, each first switch being coupled to a corresponding second input resistor;

a second operational amplifier coupled to the plurality of first switches;

a plurality of second feedback resistors, being serial-connected with one another, being connected to the plurality of first switches by one end of the serial-connected second feedback resistors and an output of the second 20 operational amplifier by another end thereof; and

a plurality of second switches, each second switch being coupled to the plurality of first switches by one end and to a corresponding second feedback resistor by another end.

25 7. The variable gain amplifier of claim 5, wherein the second stage operational amplification unit comprises:

a plurality of first switches, each first switch being coupled to a corresponding first feedback resistor;

a second input resistor coupled to the plurality of first switches;

a second operational amplifier coupled to the second input resistor;

a plurality of second feedback resistors, being serial-connected with one another, being connected to the second input resistor by one end of the serial-connected second feedback resistors and an output of the second operational amplifier by another end thereof; and

5 a plurality of second switches, each second switch being coupled to the second input resistor by one end and to a corresponding second feedback resistor by another end.

8. The variable gain amplifier of claim 5, wherein the first input resistor is coupled to the operational amplifier by way of an electrostatic 10 discharge protection device.

9. The variable gain amplifier of claim 5, wherein each of the output stages further comprises:

a PMOS transistor, whereof a source is connected to a supply voltage;

15 an NMOS transistor, whereof a source is grounded and a drain is coupled to the PMOS transistor;

a first MOS switch coupled between the pre-drive stage and a gate of the NMOS transistor, a gate of the first MOS switch being coupled to the first control signal;

20 a second MOS switch coupled between the pre-drive stage and a gate of the PMOS transistor, a gate of the second MOS switch being coupled to a second control signal;

a third MOS switch coupled between the gate of the NMOS transistor and ground, a gate of the third MOS switch being coupled to the second control signal; and

25 a fourth MOS switch coupled between the gate of the PMOS transistor and the supply voltage, a gate of the fourth MOS switch being coupled to the first control signal;

wherein the second control signal is a complementary signal of the first control signal.

10. The variable gain amplifier of claim 5, wherein each output stage further comprises:

- a PMOS transistor coupled to a supply voltage;
- a NMOS transistor coupled between the PMOS transistor and ground;
- 5 a first switch;
- a second switch;

wherein the first switch is used for connecting a gate of the PMOS transistor to the pre-drive stage when the first control signal is in a first state, and the second switch is used for connecting a gate of the NMOS transistor

10 to the pre-drive stage when the first control signal is in the first state.

11. A variable gain amplifier comprising:

a pre-drive stage comprising a first input node for receiving a input signal;

15 a plurality of output stages, wherein one of the output stages is selected by a control signal to couple to the pre-drive stage; and

a plurality of feedback impedance, each of the feedback impedances being coupled between the pre-drive stage and one of the output stages;

20 wherein the gain of the variable gain amplifier is determined according to one of the feedback impedances coupled to the selected output stages and the pre-drive stage.

25 12. The variable gain amplifier of claim 11, wherein the pre-drive stage comprising a first output node and a second output node, each of the output stages comprising a first input node, a second input node, and a output node, and each of the feedback impedance is coupled between the first input node of the pre-drive stage and the output node of the corresponding output stage.

13. The variable gain amplifier of claim 12, wherein the first input node of the selected output stage is coupled to the first output node of the pre-drive stage and the second input node of the selected output stage is coupled to the second output node of the pre-drive stage.

14. The variable gain amplifier of claim 11, wherein the variable gain amplifier further comprising an input impedance coupled to the first input node of the pre-drive stage, wherein the gain of the variable gain amplifier is determined according to the input impedance and one of the feedback impedances coupled to the selected output stages and the pre-drive stage.

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